

Trial Examination 2010
Additional Mathematics Paper 2

Section A

Answer **all** questions in this section
[40 marks]

1. Solve the simultaneous equations:
 $2x + 9y = 3$ and $xy + y + 2 = 0$ [5 marks]

2. Given the function $f(x) = \frac{10-9x}{x}, x \neq k$
- a) Deduce the value of k [1 mark]
- b) Find each of the following functions
- i) $f^{-1}(x)$
- ii) $f^2(x)$ [4 marks]
- c) Find the values of x when $f^2(x) = f^{-1}(x)$ [2 marks]

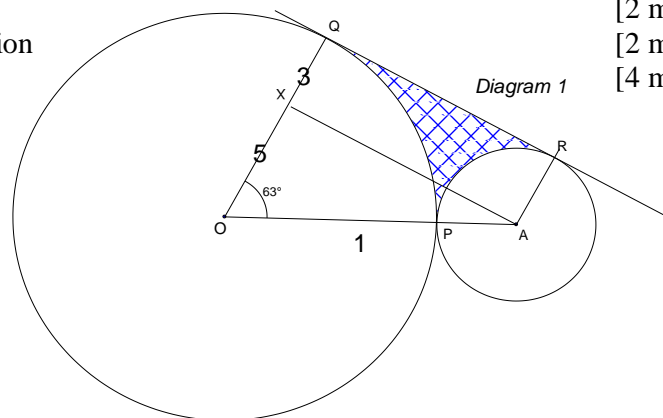
3. Without the use of a calculator or tables,
- a) show that $\sin(30^\circ + x) + \sin(30^\circ - x) = \cos x$ [2 marks]
- b) Solve the equation $2\sin(30^\circ + x) + 2\sin(30^\circ - x) = \sqrt{3} \cot x$ for $0^\circ \leq x \leq 180^\circ$ [4 marks]

4. a) A set of data X , which consists of 7 numbers, is defined by $\sum x = 28$ and $\sum x^2 = 210$.
Calculate the mean and variance of the 7 numbers. [2 marks]
- b) Two numbers 6 and k are added to the 7 numbers in (a) to form a set of data Y , which consists of 9 numbers. If the mean of the set of data Y remains the same as the mean of the set of data X , find
- i) the value of k
- ii) the standard deviation of the set of data Y . [4 marks]

5. a) Find the equation of the normal to the curve $y = 2x + \frac{6}{x}, x \neq 0$ at the point $(2, 7)$ [5 marks]
- b) If this normal meets the curve again at S , find the coordinates of S . [3 marks]

6. **Diagram 1** shows two circles with centre O and A .
The respective radii are 8 cm and 3 cm. A tangent touches the circles at Q and R .
Given that $\angle QOP = 62.9^\circ$, find

- a) the length of QR [2 marks]
- b) the perimeter of the shaded region [2 marks]
- c) the area of the shaded region. [4 marks]



Section B

Answer **four** questions in this section
[40 marks]

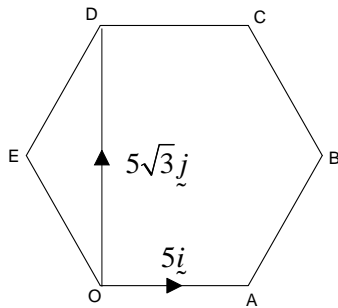
7. Use a piece of graph paper to answer this question.
Variables x and y are related by the equation, $y^n = a(3^x)$ where a and n are constants.

Table 1 shows the values of x and y obtained from an experiment.

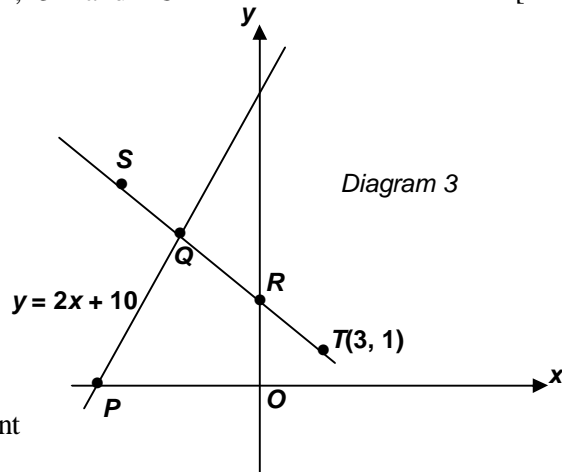
x	0	1	2	3	4	5
y	1.73	3.01	5.20	8.98	15.59	27.20

Table 1

- a) Using a scale of 2 cm to 0.50 units on the horizontal and 2 cm to 0.10 units on the vertical axis. Plot $\lg y$ against x [4 marks]
- b) Use your graph from (a) to find
- the value of a and of n , [4 marks]
 - the value of y when $x = 2.30$ [2 marks]
8. a) It is given that the position vectors, relative to the origin O , of P , Q , and R are $\begin{pmatrix} 1 \\ 14 \end{pmatrix}$, $\begin{pmatrix} 3 \\ 12 \end{pmatrix}$ and $\begin{pmatrix} 7 \\ 8 \end{pmatrix}$ respectively.
- Find the vectors \overline{PQ} and \overline{QR} [4 marks]
 - Hence, show that P , Q , and R are collinear and find the ratio $PQ:QR$. [1 mark]

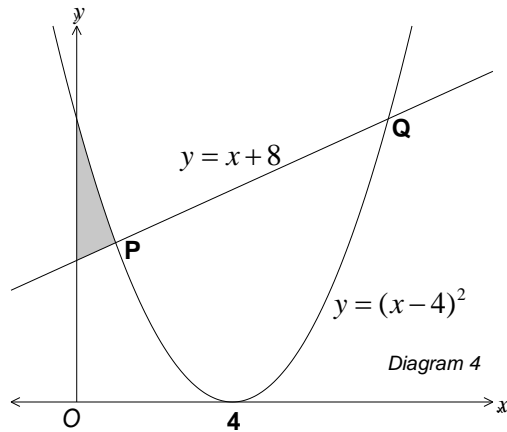


- b) **Diagram 2** shows a regular hexagon OABCDE, where $\overline{OA} = 5\mathbf{i}$ and $\overline{OD} = 5\sqrt{3}\mathbf{j}$. Find, in terms of \mathbf{i} and \mathbf{j} , the vectors \overline{AD} , \overline{OE} and \overline{EC} [5 marks]



9. **Diagram 3** shows that straight line $y = 2x + 10$ is perpendicular to ST . Q is the intersection point of the lines such that $SQ:QT = 1:2$. Find

- the equation of ST , [3 marks]
- the coordinates of Q [2 marks]
- the coordinates of S [3 marks]
- the area of the quadrilateral $OPQR$. [2 marks]



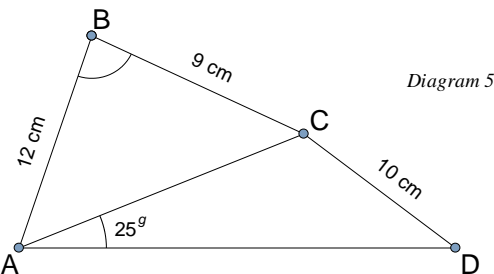
10. **Diagram 4** shows a straight line $y = x + 8$ and a curve $y = (x - 4)^2$. P and Q are the intersection points of the straight line and the curve. Find
- the coordinates of P and Q [5 marks]
 - the shaded area enclosed by the straight line $y = x + 8$, the curve $y = (x - 4)^2$ and the y -axis [5 marks]
11. a) The probability of an adult at the age of forty suffered from short-sightedness is 0.25. Five forty years old are under going an eye test. Find the probability that
- exactly 2 adults. [3 marks]
 - at least one adult, [3 marks]
- suffered from short-sightedness.
- b) The marks obtained by 4000 students in a Mathematics test are found to be distributed normally with a mean of 54 and a standard deviation of 12 marks.
- If the minimum mark for grade A is 75, find the number of students who obtained grade A. [2 marks]
 - If 20% of the students failed the test, determine the minimum passing mark. [2 marks]

Section C

Answer **two** questions from this section
[20 marks]

12. A particle moves in a straight line such that t seconds after passing through a fixed point O with a velocity 8 m/s , its acceleration, $a \text{ m/s}^2$ is given by $a = 2t - 6$ [Assume motion to the right is positive]
- Express, in terms of t , the velocity of $v \text{ m/s}$ of the particle. [1 mark]
 - Find the time intervals when the particle moves to the right. [1 mark]
 - Sketch the velocity-time graph of the motion of the particle for the time interval $0 \leq t \leq 5$. [5 marks]
 - Hence, or otherwise, calculate the total distance moved by the particle during the first 5 seconds after passing through O [3 marks]

13. **Diagram 5** shows a quadrilateral $ABCD$.



Given $AB = 12$ cm, $BC = 9$ cm, $CD = 10$ cm, and $\angle ABC = \theta$, where $\angle ABC$ is an obtuse angle. The area of triangle ABC is 27 cm².

- Calculate the value of θ . [2 marks]
- Find the length, in cm of
 - AC
 - AD ,
- Calculate the area of the quadrilateral $ABCD$. [2 marks]

14. Use a piece of graph paper to answer this question.

A furniture shop produces two models of chairs **A** and **B**. The time taken to produce and cost of production of these models of chairs are given in **table 2** below:

Model of Chairs	Time of production per chair (hours)	Production cost per chair (RM)
A	2	30
B	1.6	25

The furniture shop produces x chairs of model **A** and y chairs of model **B** per day. The production of these models by the worker per day is based on the following constraints:

- Maximum total hours utilized for making these chairs is 96 hours.
 - The least total cost of production is RM 300
 - The number of model **B** chairs produced exceeds the number of model **A** chairs by at least 5 chairs.
- Write down three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all of the above constraints. [3 marks]
 - Using a scale of 2 cm to 5 chairs on both axes, construct and shade the region **R**, which satisfies all of the above constraints. [4 marks]
 - By using your graph from 14(b), find
 - the minimum number of model **B** chairs produced per day.
 - The maximum and minimum total costs for a particular day if 15 model **A** chairs are produced during that day. [3 marks]

15. **Table 3** shows the price indices of four items P , Q , R and S for the year 2007 based on the year 2003 and the percentage rise / fall in the price indices of these four items from the year 2005 to the year 2007.

Items	Price index for the year 2007 based on the year 2003	Percentage rise / fall price index for the year 2005 based on the year 2003
P	160	+ 10%
Q	184	+ x %
R	120	-10%
S	y	+15%

The price indices of items Q and S for the year 2007 based on the year 2005 are 125 and 130 respectively.

- Find the value of x and of y [4 marks]
- Calculate the price index for the year 2007 based on the year 2005 for
 - item P
 - item R [4 marks]
- Using the weightage **1: 3: 4: 2** for the items P , Q , R and S respectively, calculate the composite index number of these items for the year 2007 based on the year 2003. [2 marks]

END OF QUESTIONS